

# **MOBILITY & ACTIVITY PATTERNS OF INDIVIDUALS AND PARENTING COUPLES IN THE METROPOLITAN AREA OF GRENOBLE (FRANCE)**

## ***Authors:***

Isabelle ANDRÉ-POYAUD – *Laboratoire PACTE Grenoble, Institut de Géographie Alpine*

Sonia CHARDONNEL – *Laboratoire PACTE de Grenoble, Institut de Géographie Alpine*

Laure CHARLEUX – *Department of Geography, Urban and Environmental Sustainability Studies, University of Minnesota - Duluth*

Kamila TABAKA – *Laboratoire PACTE de Grenoble, Institut d'Urbanisme de Grenoble*

## **ABSTRACT:**

The geographies of our daily lives are becoming increasingly complex through phenomena such as urban sprawl, scattering of life spaces and the involvement of individuals in multiple types of activities. Daily mobility behavior can be seen as the keystone holding together the spatial components and time dimensions of the daily lives of individuals, each of whom must mobilize resources (technical and economic) and competencies (cultural and social) to organize as best they can their activities and travels across their life spaces.

In this context, the conceptual framework of Time-Geography is particularly helpful, as it provides theoretical tools to investigate the space-time dimensions of daily life (Hägerstrand 1985; Lenntorp 1976; Carlestam & Sollbe 1991). Most of its principles have been adapted to mobility studies and are nowadays frequently used in the “activity-based” approach, which seeks to incorporate information on activity programs in the study of mobility behaviors (Axhausen & Gärling 1992). Our work clearly lies within this framework.

Indeed, categories traditionally used to describe trip chains are inadequate for identifying the complex modes of daily organization that lie behind the diversity of mobility patterns (Kaufmann 2004). It would thus seem necessary to develop new ways to describe jointly individuals’ trip chains, activity planning and life spaces and to investigate links between all three. This is what we aim to do in this paper, through the production of new categories of mobility behaviors, based on standardized observations (household travel survey) in the French metropolitan area of Grenoble.

## **EXPLOITATION OF A HOUSEHOLD TRAVEL SURVEY TO EXPLORE LINKS BETWEEN DAILY MOBILITY BEHAVIORS AND DAILY ACTIVITY SCHEDULES**

Previous research on daily mobility behavior (Burnett & Thrift 1979; Chapin 1974; Hägerstrand 1985; Hägerstrand 1985; Lenntorp 1976; Mac Nally 2000; Miller 2003; Orfeuil 2000; Orfeuil

& Massot 2005; Vilhelmson 1999) has shown that individuals determine their mobility strategies in relation to their daily activity schedules. Because many of these activities are mandatory and must be carried out within varying time and space constraints, individuals organize their mobility to meet these constraints as best they can.

In addition, individuals' activities and mobility are often coordinated with other members of their close circle, most commonly persons living in the same household. Thus, an individual may need to accompany another for certain trips, or to perform certain activities (and the corresponding trips) for another individual, or on behalf of the family unit. This is of course the case for parents having to chauffeur their non-autonomous children for certain activities (Kaufmann et al. 2005). Previous observations of the links between activities and mobility have been based on qualitative studies, often very narrow in scope.

Many of these studies seek to understand how individuals organize themselves to perform their daily activity programs, taking into account various spatial and temporal constraints in different contexts. For instance, some studies investigate how men and women participate differently in family- or work-related activities and how this impacts mobility patterns, in various study areas: a suburb of Paris (Buffet 2002), a peri-urban area near Grenoble (Chardonnel et al. 2004), Sweden (Friberg 2002). Other studies target the evolution of job markets and the increasing length of commute trips to show the new burdens imposed on family life (Prédali 2002; Scholten & Jönsson 2010). Bigger studies, focusing on metropolitan areas, rely on *ad hoc* diary surveys to explore the diversity of activity programs and mobility patterns: Mei-Po Kwan shows how the spatio-temporal accessibility of urban facilities varies depending on social class or ethnicity (M.P. Kwan 1998; Mei-Po Kwan 2000; M.-P. Kwan 2004); Novak and Sikora attempt to reveal the relations between different parts of the Prague metropolitan area, shaped by activity and mobility behaviors of inhabitants (Novak & Sykora 2007).

A major drawback for this type of study is the cost of *ad hoc* diary surveys, which necessarily limits the sample size to a few hundred diaries at the most. This unavoidably hampers the representativity of the results and restricts the uses that can be made of them. In this paper we carry out an experiment to determine whether it is possible to conduct such activity-based studies through the secondary analysis of already existing household travel surveys, which are not primarily intended for this kind of analysis but provide useful information on travels and activities at the individual level for extensive samples in metropolitan areas. Such a methodological experimentation is clearly one of our two main goals here.

Our second goal is a thematic one: detecting, beyond the profusion of individual trajectories described in a household-travel survey, recurrent patterns of mobility behaviors and activity schedules. Indeed, the fundamental assumption that mobility behavior results from a set of constraints and opportunities, the specific combination of which varies from one individual to another, doesn't prevent some of these constraints or opportunities from being widespread amongst numerous individuals, thus creating patterns. We use exploratory analysis methods to create typologies describing these patterns, thus highlighting the variables that best characterize them.

To identify patterns jointly describing travels and activities, we analyzed the data at two different levels:

- Level 1: analysis of individuals, based on data describing individual trajectories
- Level 2: analysis of couples with children, based on reconstituted data describing the trajectories of couples

The second level of analysis is intended to verify whether individual patterns can be matched with couple patterns in households in which children's activities impose significant constraints on the parents' mobility.

The data we rely on come from the 2001-2002 Household Travel Survey (HTS)<sup>i</sup>, carried out by the Urbanism Agency of Grenoble (AURG) on behalf of the Grenoble agglomeration's transport authority (SMTC). In France, HTSs are conducted following a standard method developed by the CERTU<sup>ii</sup> and are widely used by metropolitan transportation authorities throughout the country. Members of each household selected for the survey are asked about their trips of the previous day (times, mode, and purpose for each trip). The day for which questions are asked is always a work/school day.

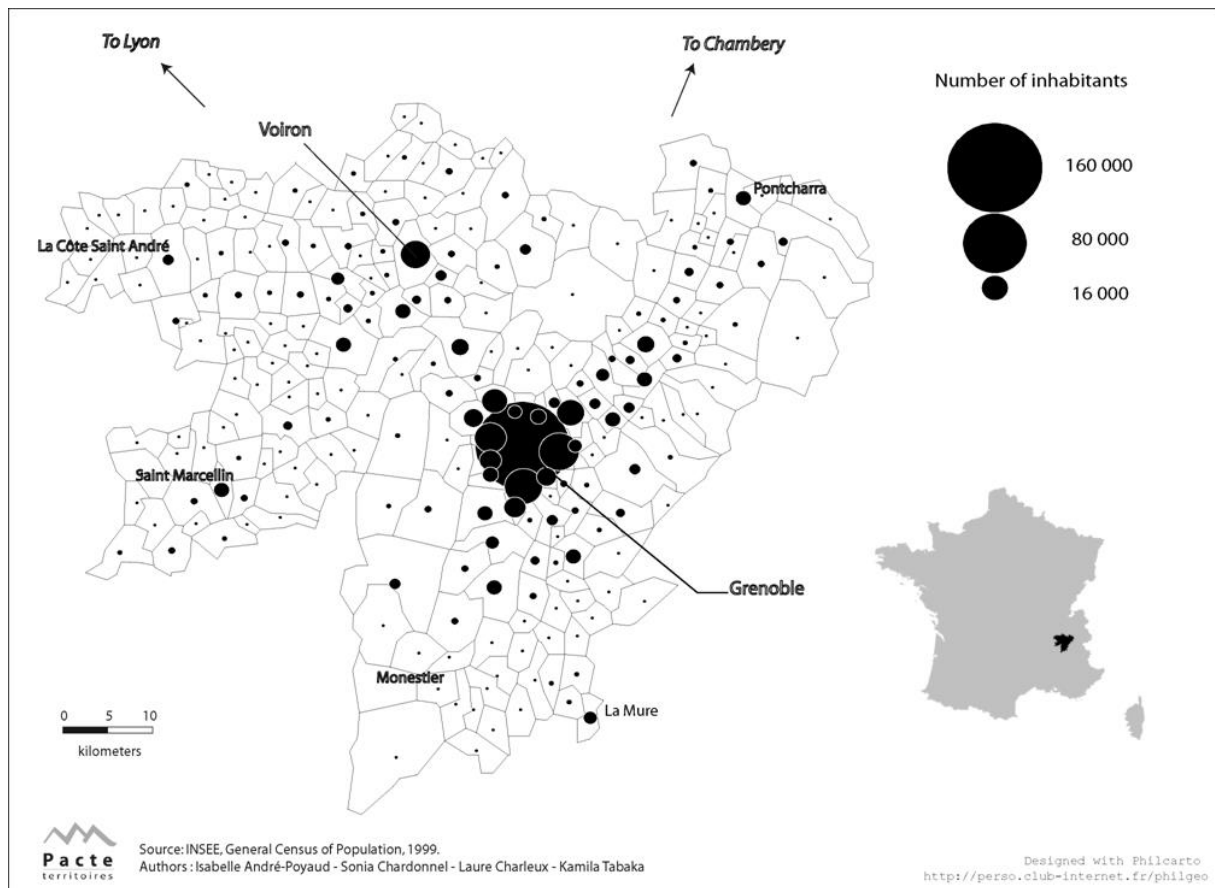
HTSs provide an overview of a day in the life of the members of surveyed households. However, the surveyed day should not be considered representative of each individual's normal schedule as, for example, some individuals with full-time jobs might have taken a day off on that day. Representativity can however be assumed for the overall sample, as it seems reasonable to think that the proportion of individuals taking a day off on their surveyed day is the same as that of any other day. When considering the analyses presented here, it is important to keep in mind that the statistical individuals derived from the HTS are person-days and not the persons themselves.

Conducted in each major metropolitan area approximately every 10 years (in France), HTSs are extremely useful for research in that the standardized methods allow good comparison over time and between cities. One drawback, however, is that they are conceived mainly as a means of collecting travel data in time and space, and thus do not allow a direct analysis of the activities associated with the travels. It is with these limitations in mind that we conducted a secondary analysis of the Grenoble Household Travel Survey data, aiming at formulating typologies able to render the most prominent characteristics of different mobility behaviors in relation to activity schedules. This article presents the methodology and the results of our secondary analysis.

# OVERVIEW OF THE GRENOBLE METROPOLITAN AREA (GMA)

Before discussing our analysis of individual's and couple's behaviors, we will first provide some background information on the territory covered by the HTS and on the mobility of its inhabitants.

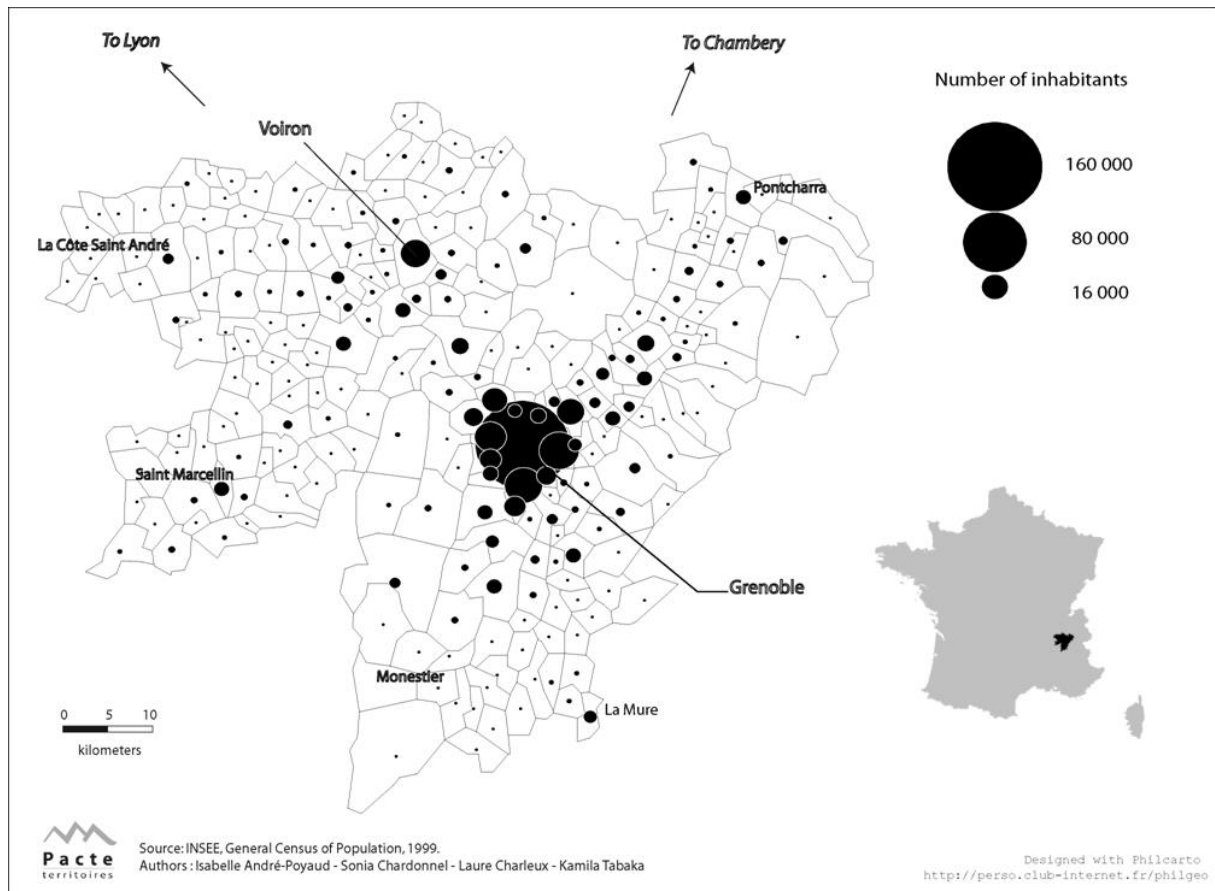
## The Survey Area



*Figure 1: Populations of the municipalities included in the Grenoble metropolitan area (1999).*

The area surveyed by the 2001-02 HTS of Grenoble is of an exceptional size (approximately 75 km north-south and 80 km east-west) amongst French HTSs, as it stretches well beyond the agglomeration itself, including peri-urban, rural and mountainous zones. This vast metropolitan area lies at the junction of three mountain ranges (Vercors, Chartreuse, Belledonne) that constrain the transport infrastructure within the Y shape formed by the three main valleys. The

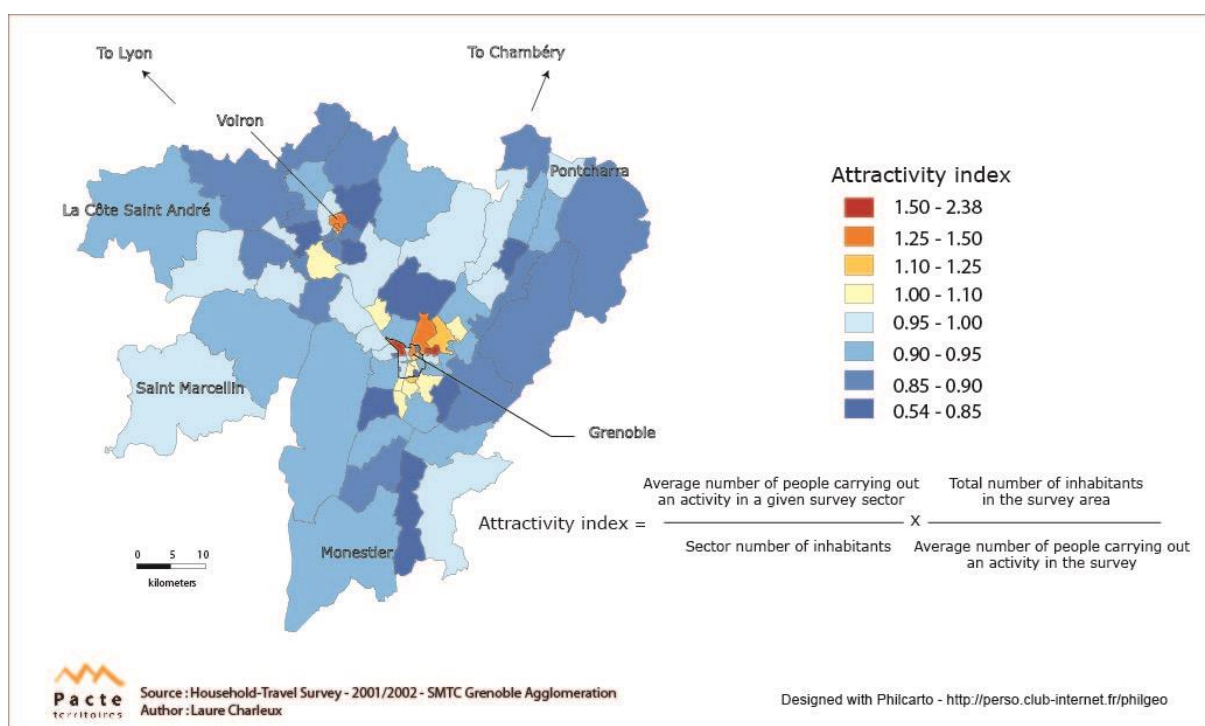
agglomeration of Grenoble itself is located at the node of the Y. As shown on



, it is the main population center (pop. 400,000), seconded by Voiron (pop. 40,000). The entire area includes 253 municipalities, with a combined population of 721,000. These municipalities are mostly small villages or towns, the populations of which carry out most of their out-of-home activities in bigger centers. Besides the road network, two main tiers of the public transportation system can be distinguished: at the regional level, transport is provided by intercity trains or coaches; locally, the agglomeration of Grenoble benefits from an effective public transit system of around 20 bus lines and 2 tramway lines (in 2002 that is; today there are 4).

The first phase of our investigation consisted in analyzing trip chains to determine the locations where individuals were carrying out their activities. For each survey sector (the survey area is divided in 83 sampling sectors and 388 origin-destination zones), we calculated the average number of persons carrying out an activity there during the 24 hour period. We then calculated

the “attractivity” index for each sector as the ratio of the average number of persons carrying out an activity there to the number of residents, corrected by the value of the same ratio for the overall survey sample. A ratio >1 indicates that the average actual density of the area is greater than its resident density; a ratio < 1 indicates the opposite. When visualizing this data, there is no surprise in learning that the two main urban centers are also the two main “attractor” areas, capable of attracting over the 24-hour period a population far greater than their respective number of residents. These findings imply travels between these attractor areas and residential areas.



*Figure 2:* Attractive areas: where the inhabitants of the Grenoble metropolitan area carry out their daily activities.

## Typology of Municipalities of the Grenoble Metropolitan Area

Not only does the variety of geographical spaces within the survey area imply travel needs, but it also provides differentiated contexts to activities and mobility behaviors. We thought it was important to determine, for instance, whether one was working in an urban center, a suburban area or a rural area. This is why, prior to analyzing individual and family days, we set out to



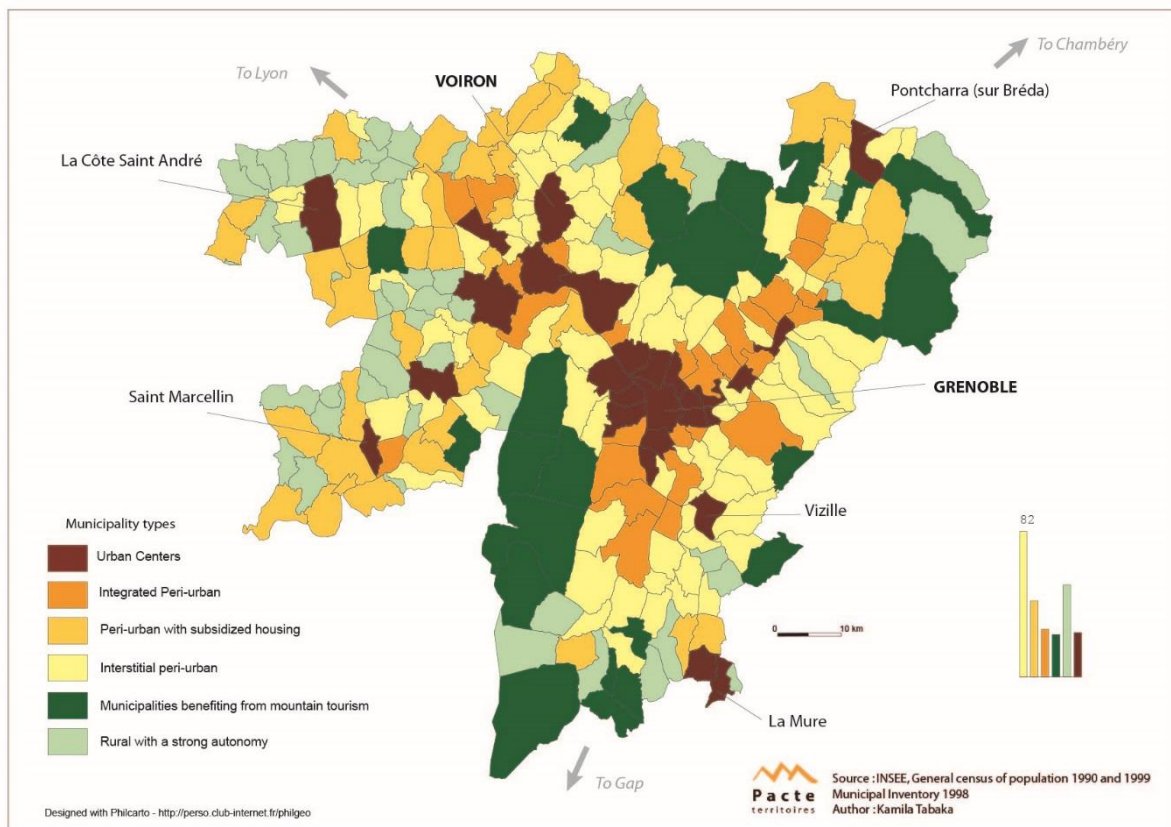
develop a typology characterizing the various spaces visited by the persons surveyed in the HTS.

Municipal data were used to develop this typology, as they provide the smallest readily available granularity of contextual data (in addition, the municipal boundaries can be matched to the boundaries of sectors and origin-destination zones of the HTS). 24 variables were drawn from the national census (1990 and 1999) and the national municipal inventory (1998). These variables included demographic and urbanism data for each municipality, local employment figures, and local infrastructure and accessibility by various transportation means.

Automatic clustering algorithms are typically used on selected variables to determine patterns within a population. However, the information carried by the variables is partially redundant. To avoid overweighting of redundant information, and to focus the analysis on the main structures of the data set, a factor analysis is usually performed on the selected variables before the clustering algorithm is applied to the main factors obtained (Lebart et al. 2002).

In our case, as all our variables were of the categorical type, we first performed a multiple correspondence analysis (MCA). The first 8 axes derived from this MCA were then used to establish the typology, using agglomerative hierarchical clustering. The most statistically relevant breakdown of the hierarchical tree resulted in 6 patterns.

In the resulting typology, urban municipalities can be seen as surrounded by three categories of peri-urban municipalities, at various distances (integrated or interstitial peri-urban, or peri-urban with subsidized housing). One category that stands out as being rather specific to the Grenoble metropolitan area is that of municipalities whose economies are highly reliant on tourism, specifically the numerous ski and/or mountain resorts. A last category is made up of municipalities located the farthest from the urban centers; they are highly rural and maintain a certain degree of autonomy (please refer to Appendix 2 for a more detailed description of these categories).



*Figure 3: Typology of the municipalities of the Grenoble metropolitan area Days of Individuals: Spatio-Temporal Patterns of Mobility/Activities.*

The overall configuration of the daily flux observed within the Grenoble metropolitan area results from the combination of individuals' mobility behaviors, which in turn are the product of the unique schedule of each individual. However, it wouldn't be relevant to focus on the uniqueness of each individual trajectory. That is why we endeavored to combine the individual trajectories into significant patterns describing their most salient characteristics. It remains to be seen, however, whether these patterns can adequately highlight associations between certain types of mobility and certain types of activity schedules and of persons, as observed by other researchers (cf. supra).

## Overview of Data Treatments

We present here a brief description of our processing of the HTS data. The first phase consisted in reconstituting a time matrix for each individual's activities, including travels, based on the trip-chain data provided by the HTS. For this purpose, we looked only at those persons declaring that they were mobile the previous day and who were able to fully describe their trip-chain, for a total sample of 14,502 individuals.

The activities were deduced from the purposes assigned to each trip by the respondents and then recoded using INSEE Time-Use Survey nomenclature (Dumontier & Pan Ké Shon 2000). One major hurdle was that the notion of purpose in the HTS is a mix of activities (shopping, work, etc.) and places (e.g. home), as well as movements (e.g. accompanying a family member). Also, because purpose is assigned to a trip, one can not determine a change of activity without a change of place: for example lunch eaten at the workplace or at school, professional activities done from home, etc. are undetectable. This difficulty must be kept in mind when considering the analyses presented below.

We also used the trip-chain data to compile trip indicators such as number of trips, trip duration, and number of municipalities visited. Relevant variables, such as gender, age, profession and socio-professional category, household composition and status, were extracted from the household and individual data sets of the HTS.

The typology of municipalities presented above (cf. section 0) was used to describe each individual's place of residence as well as the places in which the following 5 major types of activities were carried out: work, school, household logistics (shopping, services, etc.), accompanying a family member, and social/recreational activities. Persons carrying out the same type of activity in several types of municipalities are also identified.

In sum, the set of variables drawn from the HTS material and used in this study (cf.

## Appendices

Appendix 1) enable describing individual-days as a function of (1) each individual and his/her household's socio-demographic profile and (2) the individual's trips and associated activities on the surveyed day, described by the individual's time-budget and use of space<sup>iii</sup>.

### **Eight “Individual-Days” Patterns**

To characterize the various types or patterns of mobile days, we applied the same methodology as used to establish the typology of the Grenoble metropolitan area municipalities (cf. methodological description, section 0) except that, to optimize computation time, a mixed clustering procedure was implemented. To begin, a few individuals were combined into stable groups by a dynamic clustering method, and then the small groups obtained were fused together using agglomerative hierarchical clustering. Here, the first 5 axes of the factor analysis were selected for clustering. The most statistically relevant breakdown of the hierarchical tree distinguished eight patterns<sup>iv</sup>.

The eight patterns obtained can be seen as pertaining to two major categories: (1) six of the patterns are highly charged with professional or educational activities, comprising 68% of persons; and (2) the remaining two patterns are marked by the absence of such activities. In the first major category, there are three different working-day patterns, one higher-education pattern and two grade-schooler patterns. In the second major category, we distinguished one pattern consisting of a highly mobile day and another specific to retired persons. Most significant among the variables yielding the eight patterns were those relating to life cycle (such as age, having young children, etc.); also significant, though to a somewhat lesser degree, were those relating to place of residence and activities, as well as occupational category and/or employment status, and gender.

### Work or Education-Day Patterns.

The first work-day pattern described is the one we call “**all work and no play**” days, which applies to 17% of mobile persons in the HTS. These persons are employed full time and spent up to 10 hours or more at their place of work on the day surveyed. Besides work, these persons spent nearly half of the 24-hour period at home. Work and home thus being the main focal points of their day, these persons travel relatively little, typically just one round trip between home and workplace, and nearly always in a private automobile. However, total travel times for these persons are close to the survey average. Middle aged men are over-represented in this pattern and places of work are typically in the urban centers and adjacent peri-urban areas.

A second work-day pattern consists of a significant amount of time spent at work, but with one or more additional activities that result in numerous trips being made. These days we refer to as “**turbo nomad**” days, after Friberg’s denomination (Friberg 2002); 15% of mobile persons surveyed belong to this class. As with “all work and no play” days, “turbo nomad” days are characterized by full-time employment, but with less time spent at work as well as at home. It follows that persons having this type of day use more of their time engaging in other activities, e.g. accompanying other persons. The activities carried out by these persons translate into highly mobile behavior—with 5 to 7 trips in the course of the day—for which the automobile is even more the preferred choice than in the previous pattern. Men are more dominant than women in the “turbo nomad” pattern, and both are typically young parents residing in peri-urban municipalities (interstitial or integrated). Their activities and travels are typically spread over several municipalities (one or more peri-urban municipality or urban center in addition to their place of residence).

While these first two work-day patterns have different activity and travel characteristics, the individuals having these two types of days share a certain number of personal characteristics. (such as age, employment status, etc.). It would thus seem reasonable to assume that certain persons might alternately have “all work and no play” days and “turbo nomad” days.

A third professional pattern accounting for 9% of mobile persons is characterized by a strong prevalence of walking. This is due to the local character of the trips, with nearly three out of four persons remaining within the limits of their municipality of residence. These “**Multiple nearby activities**” days imply fewer trips than the “Turbo nomad” pattern. The persons having this type of day are in majority women and persons living in urban centers, with good access to urban amenities. Residents of tourist/mountain resort municipalities also have this type of day, though the amenities available locally may change from high season to low season (the HTS is conducted during the fall and winter months).

A fourth pattern accounts for 6% of mobile persons and is made up mainly of **higher-education students** (83.5% are covered by this pattern). Not surprisingly, these persons are rather young and typically single. Despite these common characteristics, the activities performed during these days are highly variable from one person to another. The number of trips and the total travel times are about the same as the averages for all mobile persons. One characteristic that stands out, however, is that these persons do not own cars, and thus use public transport to a great extent. Nearly all their activities are concentrated within the urban centers and nearby peri-urban areas.

The next two patterns concern grade school students. Both patterns are made up of demographically similar populations, such that we can suppose that certain persons alternately have these two different types of days. Combined, these two patterns account for 21% of mobile persons. These two patterns are made up almost exclusively of minors aged 5-17 years (97% and 96%, respectively, compared to 20% for the general population). Elementary school students make up 46% and 45%, respectively, middle school students 35% and high school students 18% and 19%, respectively. What differentiates the two patterns is the presence or absence of extracurricular activity, resulting in different mobility patterns.

The first of these patterns we refer to as “**grade schooler pedestrian**” days. Their days are split between home and school, with occasional extra-curricular activities. Trips are within the municipality of residence. For half of these, the mode is walking; for less than half it is by personal vehicle. The second of these patterns we call “**grade schooler motorized**” days. This pattern is characterized by trips beyond the municipality of residence, whether for educational purposes or for extra-curricular or social activities. The trips thus depend to a greater extent on motorized modes of transport, including public transportation and personal vehicles.

#### Days without Work or Education.

The “**chauffeur**” days pattern (accounting for 12% of mobile persons) is characterized by both a significant presence at home and by a high degree of mobility, as defined by a high number of trips requiring a significant amount of time, with purposes of varying types with the exception of work.

Though not dedicated to work, this type of day is often lived out by persons who are employed part time. This pattern also includes an over-representation of economically inactive or unemployed persons, but not retirees. The high degree of mobility characterizing these days can be explained by numerous activities relating to the domestic and family spheres such as shopping and accompanying others. Considering the amount of time spent at home and in making trips, other activities are necessarily brief. These are concentrated in the urban centers, and happen less often within the municipality of residence. These days can be described as a patchwork of trips to and from home, and the persons concerned can be seen as a sort of “personal chauffeur” for the members of his or her household.

Concerning mostly middle-aged women, many of whom work part time, one might expect that this type of day is lived out mainly by mothers. However, while households with children are over-represented in this pattern, and those persons living alone or couples without children are under-represented, the difference is not highly significant. The types of chauffeuring services

provided by this pattern can benefit not only dependent children but also other persons, most notably the extended family. It is also noteworthy that many persons identified with this pattern have the same individual characteristics associated with the majority of persons identified with the “all work and no play” or “turbo-nomad” patterns. Based on this observation we hypothesize that the majority of these persons alternately have these three types of days during the week. Finally, retirees are gathered in the same pattern, with 84% appearing in the pattern we refer to as “**Retired or economically inactive**”, which covers 20% of the total mobile population. Demographically, this pattern is defined by the older ages of the persons surveyed and by the absence of children in the household.

There is a total lack of work and work-related travels among this population. “Retired or economically inactive” days are largely spent in the home, but they are also characterized by trips that are somewhat long in duration, but fairly short in distance (generally within one or two municipalities). This trait may be explained by a high prevalence of walking among these persons. The number of trips as well as the purposes are quite variable from person to person, but with a fairly high proportion of time dedicated to household logistics and recreation/ social activities.



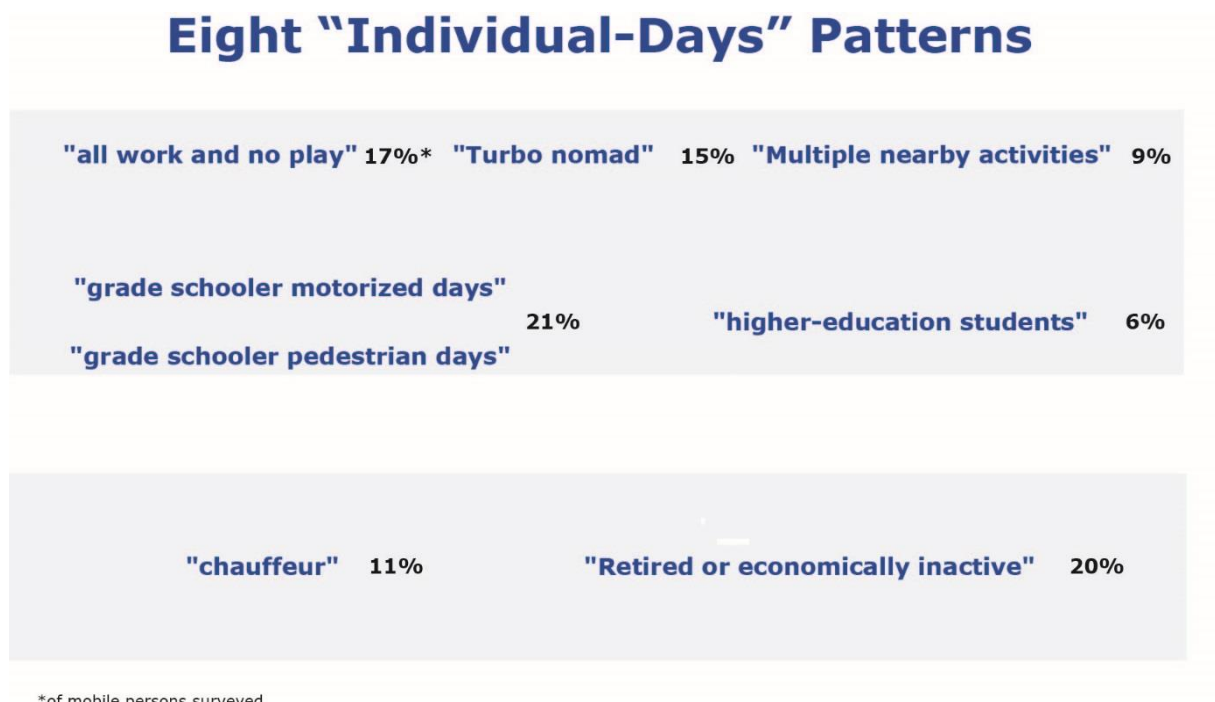


Figure 4. Synthesis of “Individual-Days” Patterns.

As we expected, the different patterns described in this section take shape through the combined specificities of activity schedule, mobility behavior, places visited and socio-demographic characteristics of the persons surveyed. It has been seen that only the “Higher Education” and “Retired or economically inactive” patterns are highly marked in terms of the persons surveyed, but less so in terms of scheduling and travels. Nevertheless, each of these patterns has a marked preference for a specific transportation mode, either public transportation (students) or walking (retirees).

## DAYS OF COUPLES

The above results help to achieve a better understanding of the co-generation of mobility and activities in individuals’ daily schedules. Based on these insights, we pursued our investigation to see whether daily mobility is played out not only at the level of the individual but rather as a complex system of interactions in which each individual must coordinate his or her schedule with those of others, as relating to work, school, family, etc.

## A Day in the Life of a Couple

To illustrate the notion of co-generated patterns, let's consider the case of a woman belonging to the "Chauffeur days" pattern. In the space-time prism below (Figure 5), we show her travels over the 24-hour survey period. The height of the rectangles is proportional to the amount of time spent at a location, and the colors indicate the type of activity performed. Trips are indicated by thin lines connecting the rectangles. The predominance of blue rectangles show that this woman spent much of her day at home, which served as a base for the numerous trips to drop off and pick up her children.

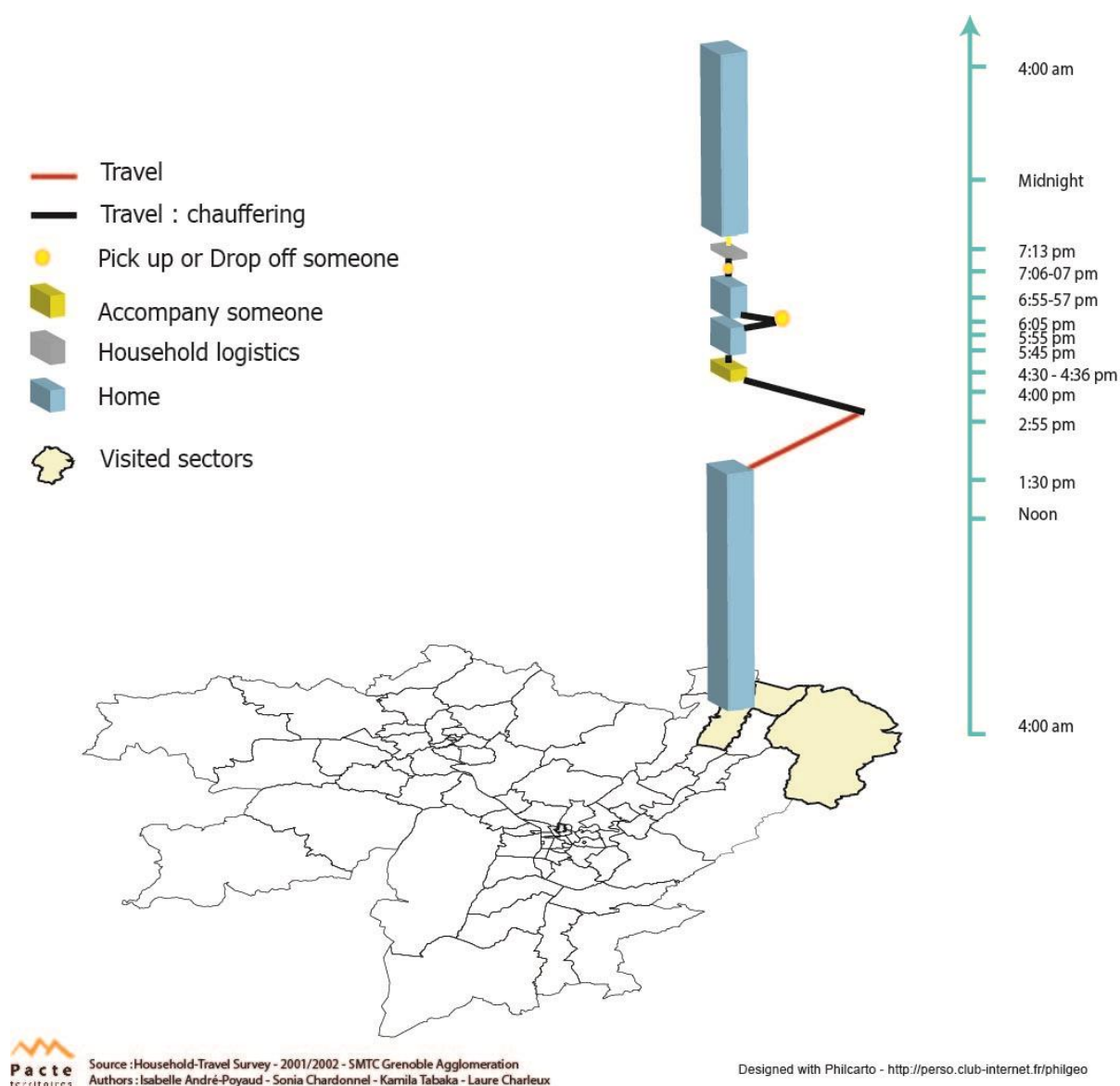


Figure 5: A Woman's day.

Figure 6 shows the woman's trajectory along with her husband's. The husband is seen to be absent from home for a considerable part of the day, with numerous trips, principally for professional purposes.

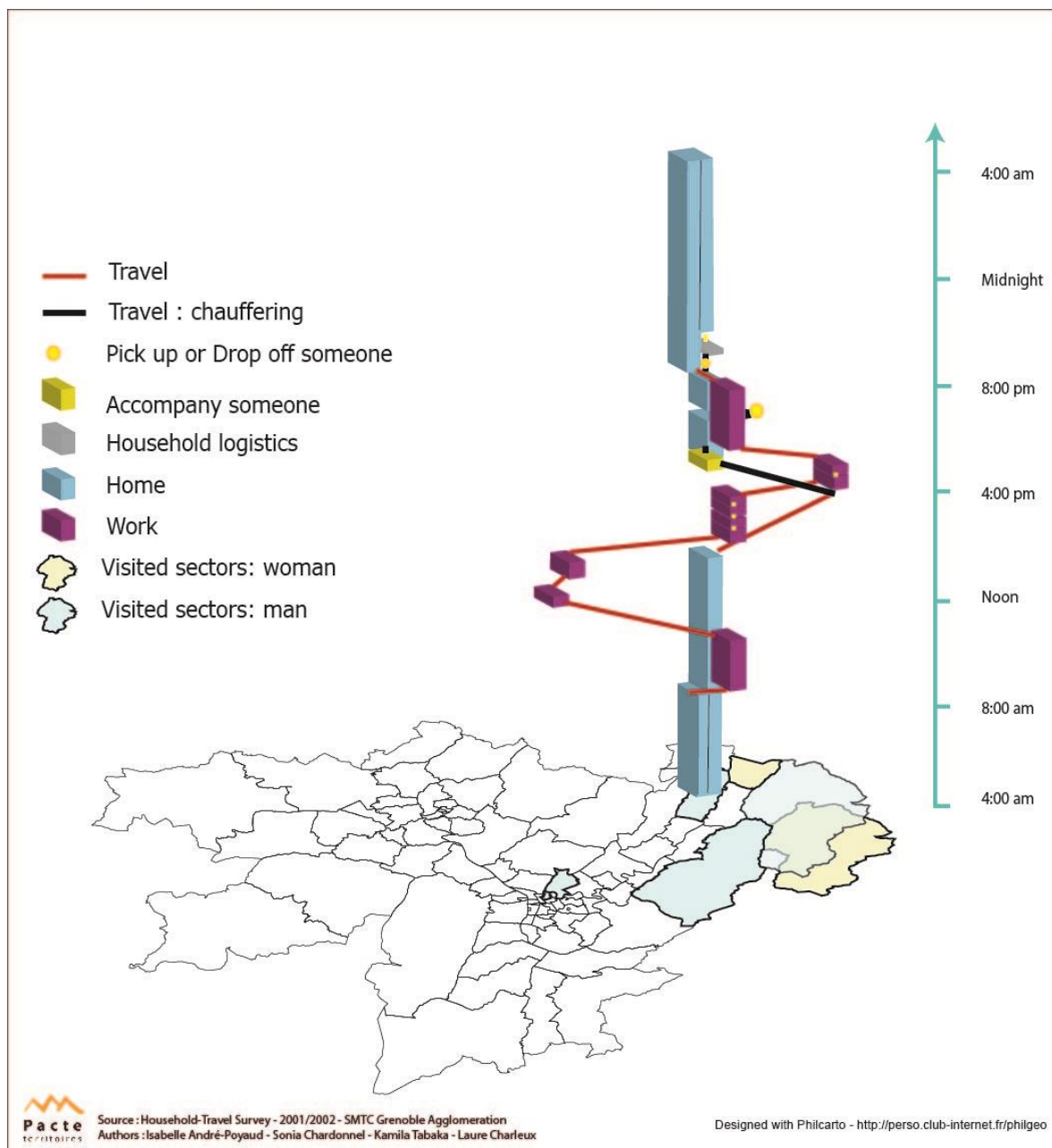


Figure 6: A couple's day.

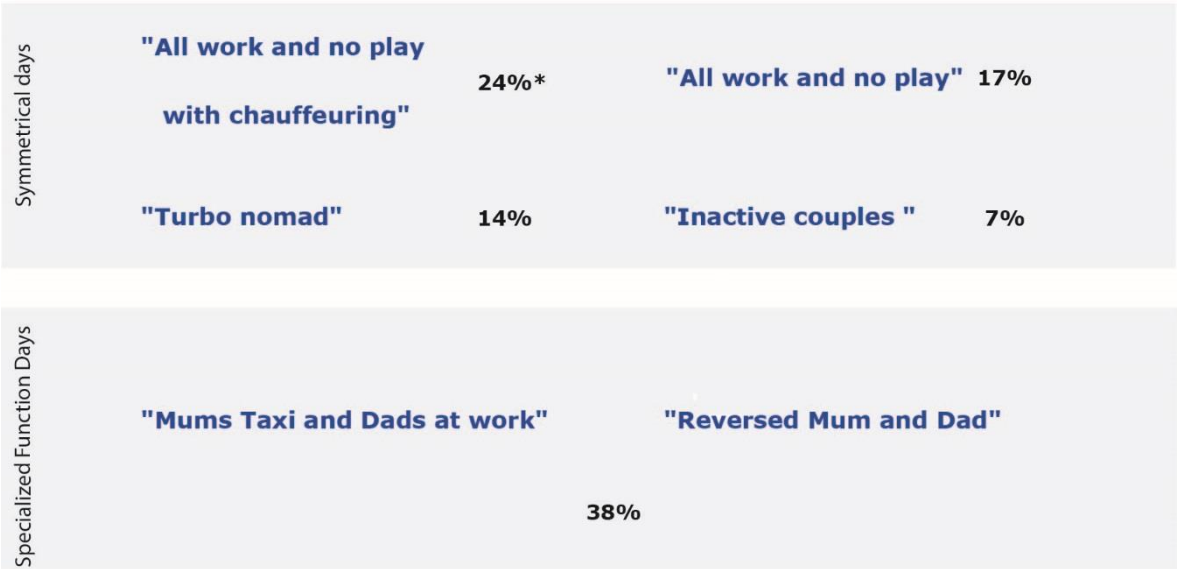
When juxtaposed, the apparent complementarity of the two trajectories leads us to the question of whether further analysis of the data might help us go beyond individual time schedules to identify differentiated patterns of family coordination. As a point of departure, we chose to analyze the coordination of couples with children living at home, with the knowledge that this subpopulation has a tendency towards a greater number of trips (due to accompanying children) and that they live more often in the peri-urban areas.

### Days of Couples with Children Living at Home

The method used to identify couple-day configurations is based on a similar principle to that described above (cf. methodological description, section 0)<sup>v</sup>. The data array used in this case combines on the same line the activities, trips and socio-demographic characteristics of the two parents (sample size: 3500 couples). The statistical unit is thus no longer the individual-day but the couple-day.

A typology of 6 classes or patterns was obtained (Appendix 4), from which we were able to distinguish two main organizational models, along with characteristic mobility features, at the couple level.

### Days of couples with children living at home



\*of mobile persons surveyed

*Figure 7: Synthesis of individual days when in “couples with children days”.*

### Symmetrical days.

These types of couple-days are characterized by a striking similarity between the men's and the women's days (62% of mobile couples). Four different patterns can be seen to fall into this group; what they have in common is that within each pattern the most significant characteristics are the same for both men and women. Thus, the couples in these types tend to be similar in their use of time and in their types of trips for the surveyed day. This symmetry in the days of couples is associated with a similarity in both members' occupational category and/or employment status. Three of the four patterns describe couples with both members employed at similar levels of qualification; the fourth pattern describes economically inactive couples.

The first pattern we will call “**All work and no play with chauffeuring**” days in reference to the individual-day pattern discussed above (24% of mobile couples).

This pattern represents couples whose members are between 35 and 49 years old, both of whom are employed, though approximately half of the women are employed only part time. More than half of these couples have two children living at home; three quarters of these families have 2 cars. These households are over-represented in the integrated peri-urban areas. These are full working days for both men and women, though longer on average for men; there is no time for recreational activity, nor for household-related tasks. Chauffering trips though are numerous, more so for women than men in terms of both travel time and number of trips, such that half the women make 5-7 trips and one third of women visit 3 municipalities.

The second of these patterns resembles the first except that accompanying tasks have disappeared for both members of the couple, who thus have true “**All work and no play**” days (17% of mobile couples). As a consequence, the working time of these women is longer than in the preceding pattern: 40% of them spend 8.5 hours or more at their working place. Two thirds of these women are employed full time and visit only two municipalities. Half of them

perform only a direct home-work-home commute. These couples are older than in the previous pattern, with an over-representation of ages 50-64 for both men and women; half of these couples have only one child that is still a minor. Many of these household (29%) have three or more vehicles, which suggests the presence of older children.

It stands to reason that the “all work and no play with chauffeuring” pattern couples may become true “all work and no play” pattern couples over time: as their children become more independent the parents are relieved of accompanying tasks. This generational difference may also be seen in the place of residence, as the households of the true “all work and no play” pattern are over-represented in the urban centers.

A third couple pattern (14% of mobile couples) corresponds to the **“turbo nomad”** individual pattern previously described, for both couple members. In some cases though it is only the man that has a “turbo nomad” day while the woman has a “chauffeur” day. For both members of these couples, mobility is pushed to the limits, with an over-representation of persons visiting four municipalities, undertaking more than 10 trips for as many as 5 or 6 different activities, including accompaniment. Many of these activities are in the urban centers, in spite of an over-representation of these couples residing in the interstitial peri-urban areas. Travel times are long (with trips mostly in private vehicles), at the expense of less time spent at home or at work. Certain activities appear to be done together as a couple.

For both men and women, these days are not necessarily typical: 97% of the men are employed full time, but on these days many of them did not complete a full day’s work; and though 77% of the women are employed, only 45% of them worked on the surveyed day. It may thus not be unreasonable to think that some of these couples have frequent “all work and no play with chauffeuring” days, considering that both patterns share a number of characteristics, including age, family make up and number of automobiles.

The last symmetrical days pattern is that of economically **inactive couples** (7% of mobile couples). The vast majority of these persons did not work on the surveyed day, and only about one quarter of them (men and women combined) have a regular job, whether part time or full time. These days are spent for the most part at home (93% of men and 92% of women spend more than 16.5 hours at home). Mobility is quite low: 40% of men and 51% of women make only 2 trips, while 47% of men and 60% of women perform only one activity outside the home; these are often either recreational or social activities performed within the municipality of residence.

Walking is over-represented in this group as the primary means of travel (33% of men and 40% of women). These are lower income households than in the previous patterns, with more than one third of couples living in subsidized housing, and 40% having only one car. However more than half live in urban centers, which is most certainly a generational effect as these couples are older: two thirds of the men and half the women are over 50; one quarter of the men are over 65. Half the men are retired, while 43% of the women declare themselves to be “economically inactive”. Children living at home are clearly independent and do not require accompaniment. Some of these couples may have formerly had non-symmetrical patterns (e.g. wife as homemaker) but which developed into symmetrical ones as their children became autonomous and the men went into retirement.

### Specialized Function Days.

Another type of couple-day identified is one in which, contrary to “symmetrical days”, each member of the couple has a specialized function: one is primarily occupied with activities relating to household management while the other carries out a professional activity (38% of mobile couples).

The first of these patterns describes young couples (40% of women are 25-34 years old) with small children and in which the woman often seems to have taken on the role of primary

caregiver instead of following a professional path. This supposition is based on the fact that 12% of these women declare their employment status as “other”, which likely includes a large proportion on parental leave (up to 3 years in France) and 40% declare themselves to be economically inactive. An additional 10% are job seekers. Amongst those women who declare having a job, 98% did not report to their place of work on the day surveyed.

The days of the mothers in this pattern include a very high number of trips (more than 10 for 21% of them) of varying purposes including accompaniment (more than 1 hour total for 22% of the women), required tasks and social activities (often within the municipality of residence). With an overrepresentation of single-car households in this pattern (32%), more than one third of the women go about their trips on foot.

The fathers in this pattern are mainly involved in professional activities (41% of them are blue-collar workers), considering that nearly half of them engaged in no other activity on the surveyed day and that 57% of them spent more than 8.5 hours at their place of work. Their mobility is limited, as one third perform just one round-trip between home and work; another third performs 4 trips, but some of these are in fact trips home for lunch and then back to work. The vast majority of men visit only two municipalities, with half of them working in the urban centers.

The roles of each member are thus clearly specialized in these couples, which tend to be low-income (as seen from an overrepresentation of “subsidized housing renters” or “other renters”, along with residency in peri-urban municipalities with a high proportion of subsidized housing), and to have more children than average (overrepresentation of families with three or more children). Thus while the father has an “All work and no play” day, the mother has a “Chauffeur” day in which the chauffeuring is often done on foot!

There is a reversed version of the “specialized function” day, a final pattern in which the father does not work on the surveyed day (96%), spends more than 16.5 hours at home (86%) and



spends a significant amount of time completing household-related tasks or accompaniments in the municipality of residence or in the urban centers. Time spent traveling is often rather long (more than 1 hour for 44% of these fathers) though the number of trips is not particularly high. However, this pattern should not be considered the same as the previous one, simply replacing the father with the mother. There are in fact some important nuances.

First of all, two thirds of the fathers declare having full time jobs; for them these are special days organized around particular family tasks. Secondly the days of the mothers in this pattern are quite diverse, and very few of the variables can be considered significant. Though the majority of these mothers reported to their place of work on the surveyed day, this was not the case for 37% of them (though 83% of them are employed), nor is there a significant reduction in the time-budget allotted to other activities when compared to the average for all mothers, with the exception of accompaniments. In addition, it appears likely that a certain number of activities are carried out jointly with the father. Furthermore, none of the variables relating to household characteristics were determined to be statistically significant.

It is as if such “reversed” (and relatively) specialized function days were characterized by the father’s atypical involvement in household and accompaniment tasks and was more likely accidental in origin and not a “normal” state of affairs!

Interestingly, the schedules of the members of these couples are quite difficult to categorize in terms of individual days, with the men seemingly having atypical “Chauffeur” days while the women’s days would have to be broken down into a number of different patterns.

## **CONCLUSION**

We hope to have demonstrated here that a secondary analysis of HTS data provides useful insights into the links between individuals’ activity schedules and their mobility behaviors. Such a secondary analysis allows for a fuller and more comprehensive analysis of the data collected through the HTS, in particular the combined analysis of data relating to movements

in space, to the sequencing of daily activities and to the family, social and economic statuses of individuals (or couples). With this approach, we hope to widen the scope of HTS analyses, which tend to focus on *trips* (Gadais et al. 2004), to include other aspects that may shed light on the complex phenomena relating to individual *mobility*.

The patterns of individual and couple days identified here provide a sketch of people's varying capacities to make use of time and space in the organization of their daily lives:

- Capacities that vary according to age group. Though mobility is an essential factor over our entire lifespan, it takes on a multitude of forms as the structuring activities of our daily schedule evolve with age.
- Capacities that vary according to employment status, as full or even part-time employment seems to anchor one's temporal and spatial organization. Unemployment on the other hand, would seem to create a void in one's daily schedule, thus imposing serious limits on individual mobility.
- Disparities of access to urban amenities, as a function of place of residence and other constraints on daily mobility.
- Capacity to coordinate and combine activities with other people (principally family members) within a shared system of mobility, determining whether participation in activities and access to places by each individual within the system is dissymmetrical, cumulative, or other.

Though promising, our approach faces obstacles arising from the types of data provided by the survey, which do not always adequately describe the real-life behaviors that we seek to understand.

The categorization of activities used to define the daily schedules of individuals can be seen as a first limitation of our secondary analysis: as mentioned above, due to the transposition of trip chains into activity schedules, activities that do not involve travel are not accounted for.

Another difficulty arises from the nomenclature used to describe the activities. Indeed our analysis highlights the importance of activities such as “accompaniment” and “recreational/social”, both in terms of number of occurrences in a daily schedule, which can be rather high, and in terms of a strong influence in the definitions of profiles. However, such denominations encompass situations that have little in common, e.g. accompanying a family member to a recreational event (sporting, concert, etc.) is clearly more related to recreational/family activities than to chauffeuring. Similarly, a daily visit to an ill family member should fall under “care”<sup>vi</sup> rather than “recreational/social”.

Another obstacle is that the availability of data for only one day thoroughly hides the propensity of individuals to adopt protean mobility behaviors in relation to the weekly or even monthly rhythms of their activity schedules. Most people would probably be reluctant to categorize themselves in one of the patterns described above, simply because, in real life, we are sometimes “turbo nomad” and other times “all work and no play”. While surveys conducted over several days have shown that adaptive mobility strategies are put into play over a multi-day span, the samples are relatively small. Observing and measuring such strategies in a systematic way on a wider scale remains a difficult (and costly) challenge.

*Maps were created using PhilCarto software (<http://philgeo.club.fr/Index.html>)*

Statistical calculations were made with SPSS software ([http://www.spss.com/fr/produits\\_solutions/](http://www.spss.com/fr/produits_solutions/)) and with SPAD (<http://www.spad.eu/>)

# APPENDICES

## Appendix 1: List of Variables Used to Produce Typologies of Individual Days and Couple Days

Themes	Variables	Categories	% of mobile
Time spent at home	Time spent at home	1 min to 12 hours	11.12
		12h - 16h30	47.29
		More than 16h30	41.60
Activities performed outside the home and types of municipalities in which they are carried out	Time spent for physiological needs (dining, medical visits, etc.)	0 min	84.11
		1 min - 30 min	3.50
		31 min - 1h	6.44
		More than 1h	5.95
		0 min	36.39
	Time spent at work or place of learning (school, university) or devoted to job seeking	1 min - 4h	7.36
		4h01 - 7h	16.31
		7h01 - 8h30	19.26
		8h31 - 10h	14.5
		More than 10h	6.18
	Time devoted to household logistics activities	0 min	62.98
		1 min - 30 min	15.87
		31 min - 1h	9.26
		1h01 - 2h	8.45
		More than 2h	3.44
	Time devoted to recreational/social activities	0 min	61.40
		1 min - 1h	10.32
		1h01 - 2h	10.03
		2h01 - 4h	10.90
		More than 4h	7.36
	Time devoted to other activities	0 min	
		1 min - 30 min	
		More than 30 min	
	Time devoted to accompanying or chauffeuring other persons	0 min	76.23
		1 min - 10 min	4.60
		11 min - 30 min	8.79
		31 min - 1h	5.41
		More than 1h	4.98
	Type of municipality visited for work	Urban centers	20.89
		Integrated peri-urban	5.35
		Municipality of residence	3.81
		Outside survey area	2.26
		Missing	61.20
	Type of municipality visited for education	Urban centers	13.15
		Municipality of residence	8.05
		Missing	75.67
	Type of municipality visited for household logistics activities	Urban centers	17.89
		Integrated peri-urban	3.48
		Municipality of residence	7.71
		2 mun., including residence	3.09
		Several mun., not residence	2.32
		Missing	62.84
	Type of municipality visited for recreational/social activities	Urban centers	15.70
		Integrated peri-urban	2.68
		Municipality of residence	11.07
		2 mun., including residence	2.43
		Missing	61.74
	Type of municipality visited when accompanying or chauffeuring other persons	Urban centers	8.32
		Municipality of residence	8.90
		2 mun., including residence	2.53
		Missing	75.33
Diversity of activities	Number of distinct types of activities (including time spent at home)	2	35.22
		3	31.70
		4	18.43
		5	8.56
		6	3.78
		0 min	36.97
Travels	Total travel time to work or place of learning	1 min - 5 min	5.41
		6 min - 10 min	10.54
		11 min - 15 min	8.16
		16 min - 30 min	21.05
		31 min - 45 min	8.21
		46 min - 1h	4.22
		More than 1h	5.43
	Total travel time to other places	0 min	-
		1 min - 5 min	3.03
		6 min - 10 min	8.08
		11 min - 20 min	14.98
		21 min - 30 min	16.20

		31 min - 45 min	18.03
		46 min - 1h	13.72
		More than 1h	25.56
Number of travels	2	24.90	
	3	8.44	
	4	24.77	
	5	10.86	
	6	11.62	
	7	6.03	
	8	4.35	
	9	2.69	
	10 or more	5.49	
	Walking	25.41	
Main travel mode	Motorcycle or bicycle	2.46	
	Car	59.43	
	Public transportation	8.86	
	Taxi	-	
	Car + public transportation	-	
	Other or combinations	-	
	No dominant mode	2.26	
Number of distinct municipalities visited	1	28.46	
	2	43.90	
	3	19.20	
	4 or more	8.43	
Characteristics of individuals	Gender	Male	49.99
		Female	50.02
Age	0 - 4 y/o	Not in the	
	5 - 17 y/o	20.07	
	18 - 24 y/o	11.89	
	25 - 34 y/o	14.77	
	35 - 49 y/o	24.57	
	50 - 64 y/o	27.24	
	65 y/o or more	11.46	
	Professional (or educational) category	Not working	4.56
		Unemployed	3.96
		Retired	14.21
		Preschool or elementary	9.42
		Junior High	7.25
		High School	4.32
		Higher Education student	6.78
		Other student, intern	-
		Farmer	-
		Craftsman, storekeeper	2.48
		Executive, professional	8.55
		Intermediate occupations	12.07
		Employee	13.33
		Blue-collar worker	9.05
		Other	2.31
		No answer	-
Working time	Full-time	37.72	
	Part-time	8.28	
	Not applicable	53.99	
Characteristics of households	Type of the municipality of residence	Urban centers	44.23
		Integrated peri-urban	19.35
		Peri-urban with subsidized housing	9.21
		Interstitial peri-urban	19.57
		Touristic municipalities	5.84
	Type of household	One-person household	14.04
		Couple without children	20.14
		Non-family household of 2	20.14
		Couple with 1 child	14.96
		Couple with 2 children	22.18
		Couple with 3 children or more	15.31
		Single-parent family	7.33
		Non-family household of 3 or more	-
		Other	3.41
	Occupancy status	Owner	58.65
		Owner paying mortgage*	3.64
		Renter of subsidized housing	12.82
		Other renter	22.26
		Free rent	-
		Other	-
	Number of cars (or trucks)	No car	8.29
		1	37.42
		2	43.40
		3	8.72
		4	2.18

\*It is very likely that most "owners paying mortgage" are wrongly categorized as simply "owners", as this distinction is not usually made. The average rate of "owners paying mortgage" for France is about 20%, whereas less than 4% were declared in this survey.

## **Appendix 2: Typology of the Municipalities of the Grenoble Metropolitan Area**

### Type 1 - Urban Centers

Municipalities with a low rate of owner occupation of individual homes and a high concentration of subsidized apartment units with few buildings erected since 1982. Population increased over the period 1990-1999, but at a relatively low rate; ages 20-40 strongly represented in the population. High unemployment; high unemployment levels, despite large number of local jobs (>90% the number of economically active local residents). Areas well served by public transportation, both local and interurban (train, tram, bus); low motorway access time (<10 minutes).

### Type 2 - Integrated Peri-urban

Municipalities with a high proportion of recent buildings/homes and a high rate of owner occupation. Residences evenly divided between apartment/condominium buildings and individual homes. High rate of population growth. Areas well served by public transportation; low motorway access time (<10 minutes). High concentration of “big box” stores.

### Type 3 - Peri-urban with Subsidized Housing

Municipalities with a high concentration of subsidized housing units, along with significant owner occupation levels. Commuting rates comparable to the Grenoble metropolitan area average, with 64% to 82% of economically active persons commuting; rather low local employment rate (40% to 60%) with relatively high unemployment (between 8.5% and 11%).

### Type 4 – Interstitial Peri-Urban

Municipalities with a high proportion of 40-60 year olds, as well as <20 years old; strong population growth. Low rate of local employment compared to number of economically active residents, >80% daily interurban commuting.

Moderate motorway access time (<20 minutes); public transportation consists mainly of interurban coaches.

High proportion of single-family homes along with high rate of owner occupation (>75%).  
Presence of “big box” retail stores and recreational sports facilities.

#### Type 5 – Municipalities benefiting from mountain tourism

Areas with well-developed tourism services, both public and private, including both smaller merchants and “big box” retail, to meet the requirements of high tourist visitation. Low rate of daily interurban commuting; high rate of local employment as compared to number of economically active residents. Considerable distance/time from motorway, as well as from the other municipalities most frequently visited by residents. Fairly low proportion of single-family dwellings and rate of owner occupation.

#### Type 6 – Rural with Strong Autonomy

Municipalities with a high proportion of 60+ year olds. Public transportation not available, but other services are. Housing stock almost entirely made up of singly-family homes, with little recent and/or subsidized housing. Ratio of local jobs to economically active population does not exceed 65% (rate of local employment). Big box stores typically nonexistent.

### **Appendix 3: Eight Class Typology of Individual Days**

#### Pattern 1: “All work and no play” days (17%)

This group is principally male (67%/50%<sup>vii</sup>) and employed full-time (90%/38%); with an over-representation for the age groups 35-49 (39%/25%) and 50 - 64 (30%/18%). About one quarter of this population are in the age group 25-34 (22%/14%). Nearly three quarters (73%/44%) have activities in only two municipalities, and there is a very strong tendency for car travel (85%/65%). These persons do not indicate any activities other than work. Not surprisingly then, their number of trips and travel purposes are from 2 to 4 (respectively 43%/26% and 32%/24%). For this group, places of work are generally in the urban centers (54%/21%) or integrated peri-urban areas (16%/5%); only a small number work beyond the HTS area limit (9%/2%).

It is worth noting that while urban center inhabitants are underrepresented in this pattern, their numbers are still significant (38.7% compared to 44% on average).

#### Pattern 2: “Turbo-nomad” days (15%)

The majority of persons in this pattern live in interstitial peri-urban (27%/20%) or integrated peri-urban areas (25%/19%). They are employed (75% full time and 20% part time). More than half are in the 35-49 age group (56%/25%); one quarter are in the 25-35 age group (22%/14%). Males are slightly overrepresented (54%/50%). The majority of persons visit 3 or more municipalities (74%/28%), with 4-6 different purposes (81%/31%). A very significant majority make 5 or more trip (89%/41%), and almost exclusively in a private vehicle (92%/65%). These days typically include work along with household logistics, recreational, and social activities, and drop off/pick up of other persons. This pattern resembles the preceding one in that places of work are largely located in the urban centers (54%/21%) or integrated peri-urban areas (14%/5%). Household logistics activities tend to be carried out in the urban centers (29%/18%), and to a lesser degree in the integrated peri-urban areas (7%/3%).

More than half drop off or pick up other persons during the day (52%/37%), (23%/8%) (16%/9%). Recreational and social activities (43%/38%) are most often carried out in the urban centers (21%/16%).

#### Pattern 3: “Multiple, nearby activities” days (9%)

The majority of days in this pattern involve residents of the urban centers (64%/44%), and to a lesser extent those of touristic municipalities (10%/6%). Women are significantly overrepresented, making up nearly two thirds of this pattern (62%/50%). This pattern is somewhat younger than the preceding one with only about one half in the 35-49 age group (49%/25%) and more than a quarter in the 25-34 age group (28%/14%). Only about one third visit two municipalities or more (32%/44%); most perform all their activities within one municipality (62%/28%), with one third carrying out 4 trips (34%/24%). For more than 40%,



walking is the main mode of travel. Half belong to single-car households. Most are employed: three quarters full time, and one quarter part time (though nearly one quarter did not work on the day surveyed). More than two thirds did not carry out household logistics activities, but the small number doing so carried them out in the municipality in which they reside (15%/8%). Most did not engage in recreational or social activities, and about one quarter of them engaged in drop off/pick up activities of one hour or less (27%/19%), and mostly within their municipality of residence (21%/9%). Though used significantly less than on average, private automobiles remain the most frequent means of travel (52.8%/64.7%).

#### Pattern 4: Higher Education Students (6%)

This pattern is named for its very strong association with higher education students (80%/5%). A very high percentage of these persons live in the urban centers (88%/44%), with three quarters of them following studies in the same urban center. One third use public transportation and another third walk. Nearly two thirds indicate 3 to 4 purposes, which give rise to as many as 6 or 7 trips (respectively 17%/12% and 8%/6%). Nearly one quarter conduct household logistics activities within the urban centers, while more than a third conduct recreational or social activities in those areas.

#### Pattern 5a: Motorized grade schoolers (travel beyond municipality of residence) (11%)

These individuals are ages 5-17 (88%/21%). They are elementary, middle, and high school students living especially in the interstitial peri-urban (30%/20%) and integrated peri-urban areas (24%/19%).

The majority of these children visit two municipalities (70%/44%). Many make only two trips (38%/26%) for two or three purposes (82%/67%). There is a high proportion of public transportation use among this population (28%/7%).

Personal vehicle usage is high, though much lower than average (44%/65%). Nearly two-thirds attend school in the urban centers (64%/13%) (*which are not their municipalities of residence*,

*as seen from the very small proportion that attend school within their municipality of residence).*

Many of these students partake in recreational/social activities, especially in the urban areas (19%/15%). Strongly under-represented, but still quite significant, over a quarter of these individuals live in the urban areas (26.3%/44%).

Pattern 5b: Pedestrian grade schoolers (travel limited to municipality of residence) (10%)

These individuals are ages 5-17. Three-quarters attend elementary school and nearly one quarter middle school. The overwhelming majority of them stay within just one municipality (83%/28%).

They make 4 to 6 trips (respectively 41%/24% and 14%/12%) for two different purposes (52%/36%).

Half of the individuals make their trips on foot (50%/22%). Use of private vehicle remains high, but is lower than average (45%/65%). Nearly one third of individuals have a social activity, especially in their municipality of residence.

Finally, it should be noted that there is a slight overrepresentation of residence in touristic municipalities (8%/6%).

Pattern 6: “Chauffeur” days (12%)

This pattern is seen more than other patterns in the peri-urban areas (60% compared to 48% on average). The pattern is distributed as follows: one quarter in the interstitial peri-urban, one quarter in the integrated peri-urban and a smaller fraction in the peri-urban with subsidized housing (11%/9%).

This pattern is clearly female dominated (64%/50%). One third of persons are in the age group 35-49, one quarter in the age group 50-64 and close to one quarter in the age group 25-34.

One quarter of individuals in this pattern belong to two-person households (couples without children). Nearly half of them do not work: economically inactive (17%/5%), retirees (17%/14%), job-seekers (11%/4%).

These days are characterized by the absence of activity related to work or training and a high number of trips (85%/41% make 5 or more, with nearly one quarter making 10 or more trips) visiting several municipalities (56% visit 3 or more municipalities, compared to 28% overall).

Trips are made overwhelmingly by car (84%/65%) and are used to carry out household logistics, recreational/social activities and accompaniments.

More than a third of individuals carry out household logistics activities in the urban areas (36%/18%). More than half engage in recreational/social activities; one quarter of them do these activities in the urban centers (23%/16%).

Two-thirds of the individuals do accompaniments, nearly one quarter within the municipality of residence (22%/9%) and a similar number in the urban centers (21%/8%).

#### **Pattern 7: “Retired or economically inactive” days (20%)**

This pattern is seen among retirees (57%/14%), economically inactive persons (13%/5%) and job seekers (9%/4%). More than half live in the urban centers (52%/44%), and more than half are female (56%/50%).

They visit 1 or 2 municipalities (respectively 44%/28% and 46%/44%), and make 2 to 3 trips (respectively: 46%/26% and 13%/8%), for 2 to 3 different purposes (55%/36% and 35%/31%).

More than half conduct household logistics activities, one quarter in the urban centers (26%/18%) and a smaller fraction in their municipality of residence (18%/8%).

More than half also conduct recreational or social activities (52%/38%), either in their municipality of residence (20%/11%) or in the urban centers (18%/16%).

## **Appendix 4: Six Class Typology of Days of Couples with Children Living at Home**

### **Pattern 1: “All work and no play with chauffeuring” days (24%)**

Women spending between 12 and 16.5 hours at home (76%/42%), working either in the urban centers (58%/31%) or in integrated peri-urban areas (12%/6%), with a work day of 4 to 7 hours (21%/10%) or 7 to 8.5 hours (40%/20%) or up to 8 to 10 hours (21%/12%). Many are part time (48%/33%). 4 different travel purposes (39%/23%), including accompaniment of less than 30 min. duration (48%/26%) or 30 min to 1 hour (22%/17%), either within the municipality of residence (37%/25%) or in the urban centers (25%/15%). Recreational or social activities are typically absent (83%/70%), as are required tasks (64%/51%). These women are employed as service workers (41%/34%), as middle managers/teachers/nurses, etc. (34%/21%) or as managers (16%/10%). Travel time to work is 16 to 45 min. (46%/25%) and by car (89%/78%). 3 municipalities are visited (34%/23%). 5 to 7 trips (51%/30%). Ages 35 to 49 (67%/58%).

Men are employed full time (98%/88%), and spend between 12 and 16.5 hours at home (73%/56%). They spend at work 7 to 8.5 hours (31%/24%); 8.5 to 10 hours (33%/24%); more than 10 hours (19%/13%). No recreational or social activities (87%/75%), nor required tasks (79%/67%). They work in the urban centers (53%/39%), in integrated peri-urban areas (15%/11%) or outside the survey area (9%/5%). Ages 35 to 49 (69%/59%). Accompaniments of less than 30 min. (32%/24%), within the municipality of residence (24%/14%). Same levels of professional qualifications as women, but with somewhat lesser over-representations.

Two-vehicle households (74%/61%), with two minor children (55%/45%), living in integrated peri-urban areas (28%/22%).

### **Pattern 2: “All work and no play” days (16.8%)**

Women with no accompanying activities (96%/42%), indicating only two different travel purposes (56%/22%) and making only two trips (48%/17%). No required tasks (83%/50%). 12 to 16.5 hours spent at home (72%/42%). Employed full time (65%/39%). 2 municipalities

visited (68%/42%). Working in the urban centers (54%/31%). Long work days: 7 to 8.5 hours (36%/20%); 8.5 to 10 hours (29%/12%); more than 10 hours (11%/3%). No recreational or social activities (89%/70%). Travel time to work: 16 to 30 min. (33%/17%). Working in municipality of residence (11%/6%) or integrated peri-urban (10%/6%). Service workers (46%/34%) and or laborers (11%/5%). Ages 35 to 49 (66%/58%) or 50 to 64 (23%/13%). Men ages 50 to 64 (38%/20%), spending 12 to 16.5 hours at home (70%/56%), working full time (95%/88%). Full but not particularly long work day of 7 to 8.5 hours (35%/24%). Place of work in the urban centers (49%/39%). No accompaniments (73%/62%). No required tasks (78%/67%). No social or recreational activities (82%/75%). Only two purposes (39%/30%). Families with only one minor child (51%/35%), but often 3 vehicles (22%/14%), sometimes as many as 4 (7%/4%). Home owners (77%/64%), often in the urban centers (42%/37%).

### Pattern 3: "Turbo-nomad" days (14.3%)

Men visiting more than 4 municipalities (57%/15%), with 5 or 6 different purposes (50%/17%), making 10 or more trips (27%/9%) and spending less than 12 hours at home (43%/20%). Travel time to work of more than 1 hour (34%/15%). Work activities carried out in several municipalities (18%/6%). Travel time to other destinations more than 1 hour (44%/25%). Working hours fairly short 4 to 7 hours (25%/12%), though declaring full time employment (97%/88%). Personal care, eating, etc. times of more than one hour (15%/7%), required tasks less than 30 mins. (28%/16%) and in the urban centers (30%/18%), recreational/social activities 1 to 2 hours (16%/8%) in the urban centers (21%/11%). Trips by car (92%/81%). Accompaniments of 11 to 30 min. (25%/15%), in the urban centers (25%/13%) or in several municipalities (7%/2%).

Women also visiting more than 4 municipalities (39%/11%), with travel time to destinations other than work of more than 1 hour (52%/24%), 10 or more trips (27%/9%), for 6 or 7 different reasons (31%/11%). Trips by car (91%/78%). Accompaniments of more than 1 hour

(29%/16%), in several municipalities (11%/4%). Personal care, eating, etc. times of more than one hour (13%/6%), recreational/social activities of 1 to 2 hours (17%/9%) in the urban centers (22%/12%). Required tasks of 1 to 2 hours (22%/13%) in the urban centers (34%/23%). Households located in interstitial peri-urban areas (39%/23%), and possessing 2 vehicles (74%/61%).

#### Pattern 4: “Inactive couples” days (7.2%)

Men with only non-work travel purposes on the day surveyed (96%/22%) and spending more than 16.5 hours at home (93%/24%). Retirees (47%/4%), job seekers (15%/3%) or “other” (11%/2%). Ages 50 to 64 (43%/20%), or 65 or more years old (24%/2%). Many walk (33%/10%) and make 2 trips (40%/22%) with two different purposes including return to home (47%/30%) : required tasks for 30 min to 1 hour (19%/7%) in the urban centers (34%/18%) or social/recreational activities for 2 to 4 hours (18%/7%) in their municipality of residence (17%/7%). No accompaniments (79%/62%). Many stay within just one municipality (37%/15%).

Women with only non-work travel purposes on the day surveyed (92%/47%) and spending more than 16.5 hours at home (92%/51%). Travel is often by foot (40%/18%) and two trips are made (51%/17%) with two different purposes including return to home (60%/22%), most notably social/recreational activities for 2 to 4 hours (14%/7%) in the municipality of residence (15%/10%). No accompaniments (80%/42%). Economically inactive (43%/16%), job seekers (9%/4%) or "other" (8%/5%). Ages 50 to 64 (37%/13%). Majority stay within just one municipality (51%/24%).

Subsidized-housing dwellers (36%/12%), one vehicle (40%/20%), and one minor child living at home (56%/35%). Place of residence in the urban centers (56%/37%).

#### Pattern 5: "All work and no play" & "chauffeur" days (26.9%)

Women with only non-work travel purposes on the day surveyed (98%/47%) and spending more than 16.5 hours at home (95%/51%). Ages 25 to 34 (40%/27%). Economically inactive (40%/16%), job seekers (10%/4%) or "other" (12%/5%). Often more than 10 trips (21%/14%), but within one municipality (46%/24%) and often by foot (33%/18%). Various travel purposes: social/recreational, often for less than one hour (17%/11%), within the municipality of residence (17%/10%); 30 min to 2 hours of required tasks (34%/25%), within the municipality of residence (18%/9%); more than one hour of accompaniment (22%/16%), within the municipality of residence (35%/25%).

Men with no accompaniment activities (85%/62%), no required tasks (84%/67%), employed full time (98%/88%), spending 12 to 16.5 hours at home (72%/56%) and with a rather long work day, often 8.5 to 10 hours (34%/24%) or more than 10 hours (23%/13%). Only 2 (31%/22%) or 4 trips (34%/22%), for two different purposes including return trip home (44%/30%). Two municipalities visited (60%/46%). Laborers (41%/26%). Ages 25 to 34 (26%/18%).

Often single family households (32%/20%), housing status indicated as "other renter" (20%/14%) or subsidized renter (16%/12%). Families with 3 minor children (26%/21%).

#### Pattern 6: "reversed" days (10.8%)

Men with only non-work travel purposes on the day surveyed (96%/21%) and spending more than 16.5 at home (86%/24%). Some job seekers (12%/3%) or others (8%/2%), but the majority are employed full time (68%/88%). More than one hour of travel time (44%/25%). 1 to 2 hours (16%/7%) or more than 2 hours of required tasks (10%/2%), in the urban centers (33%/18%), in two municipalities including that of residence (6%/2%) or within municipality of residence (10%/5%). Often more than 1 hour of accompaniment (13%/6%) or 11 to 30 minutes (23%/16%), within the municipality of residence (25%/14%). Staying within just one municipality (29%/15%).

Women visiting 3 municipalities (35%/23%). Working 4 to 7 hours (18%/10%). Service employees (44%/34%). Less than 10 min. of accompaniment (13%/8%) but often 2 hours or more of required tasks (9%/5%) in the urban centers (35%/23%).



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## NOTES

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<sup>i</sup> *Enquête Ménages-Déplacements (EMD)* in French

<sup>ii</sup> The Center for the Study of Urban Planning, Transport and Public Facilities (*Centre d'études sur les Réseaux, les Transports, l'Urbanisme et les constructions publiques*), is an applied-research body within the French Ministry for Ecology, Energy, Sustainable Development and Territorial Planning

<sup>iii</sup> The characteristics of individuals' travels and schedule strictly refer to the day on which they were surveyed, as described by trip-chain data. No variable is available to give insight into individuals' mobility behavior and activity schedule in the wider context of daily or weekly routines for instance.

<sup>iv</sup> Each of the 8 patterns is described in detail in Appendix 3 as a fictive person-day gathering the most prominent characteristics of the pattern.

<sup>v</sup> Considering the smaller size of the sample (3500 couples) in this second analysis, we did not need to perform a dynamic clustering before the agglomerative hierarchical clustering.

<sup>vi</sup> This notion of “care” for other persons doesn't appear in standard nomenclatures

<sup>vii</sup> Read: 67% of individuals in this pattern are men, as compared to 50% of the mobile persons in the sample.